structure and is excellent in the stability at high temperatures and in the resistance to oxidization. As a result, the storage characteristics at high temperatures of the polymer battery are also improved.

In the resulting gel electrolyte, the crosslinked host polymer has a sufficient affinity with the liquid organic electrolyte, and the separator is closely adhered to the surface of the positive electrode and the negative electrode.

While the novel features of the invention are set forth particularly in the appended claims, the invention, both as to organization and content, will be better understood and appreciated, along with other objects and features thereof, from the following detailed description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

Fig. 1 is a transverse cross sectional view of an example of a polymer battery of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The host polymer used in the present invention is a crosslinked copolymer having a branched structure composed of a main-chain or a trunk chain, and a side-chain. The main-chain has a polyvinylidene fluoride structure and the side-chain has an alkylene oxide unit and at least one of an acrylate unit and methacrylate unit. Since the main-chain

contains a vinylidene fluoride unit, the main-chain has an excellent stability at high temperatures. On the other hand, since the side-chain contains an alkylene oxide unit, the side-chain has an excellent affinity with a liquid organic electrolyte and gives an excellent gel-forming function to the host polymer.

The host polymer as above has different physical properties from those of a mixture of polyvinylidene fluoride with a polyalkylene oxide having an acrylate unit or methacrylate unit at the end of the chain. In the above host polymer, the polyvinylidene fluoride structure and the alkylene oxide structure are distributed homogeneously as compared with the above mixture. The homogeneous host polymer has an extremely good affinity with a liquid organic electrolyte and has a good strength. Consequently, it provides a gel electrolyte having an excellent stability at high temperatures.

The molecular weight of the aforementioned copolymer before crosslinking is preferably about 100,000 to 1,500,000.

The side-chain contains at least one of an acrylate unit and methacrylate unit which has a polymerizable double bond. Thus, the aforementioned copolymer can be crosslinked after the copolymer has swelled in a liquid organic electrolyte. The crosslinked host polymer has a good stability at high temperatures, an excellent affinity with the liquid organic electrolyte and a homogeneous network structure,

and therefore the gel electrolyte becomes to have an excellent stability at high temperatures.

The main-chain of the above-mentioned copolymer preferably has a structure of polyvinylidene fluoride, a copolymer of vinylidene fluoride-hexafluoropropylene, a copolymer of vinylidene fluoride-chlorotrifluoroethylene, a copolymer of vinylidene fluoride-pentafluoropropylene, a copolymer of vinylidene fluoride-hexafluoropropylene-tetrafluoroethylene and a copolymer of vinylidene fluoride-perfluoromethyl vinyl ether-tetrafluoroethylene. The molecular weight of the main-chain is preferably about 100,000 to 1,000,000.

Examples of the alkylene oxide constituting the side-chain of the above copolymer are ethylene oxide and propylene oxide. Only one kind or a plurality of these units may be contained in the side-chain. The side-chain preferably contains an acrylate unit or methacrylate unit at the end of the polyalkylene oxide structure.

In the above copolymer, the content of the side-chain is preferably 1 to 30 wt% and more preferably 1 to 10 wt%.

When the content of the side-chain is less than 1 wt%, the host polymer has an insufficient gel-forming ability, and when the content is more than 30 wt%, the host polymer has a decreased stability at high temperatures.

The side-chain is preferably composed of a polyalkylene glycol diacrylate or polyalkylene glycol